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Cost and Performance of Preventive Maintenance

Ohio Asphalt Paving Conference

February 4, 2015

NATIONAL SECURITY

ENERGY & ENVIRONMENT

INFRASTRUCTURE

HEALTH SOLUTIONS

We will cover PM from several angles

- **A common understanding**
- **How long does it last?**
- **A Few Questions on Pavement Maintenance**
- **What is the cost/benefit?**
  - NewMexirado Case Study
  - Champaign County Case Study

Preventive maintenance based on plans

- Planned strategy
- Cost effective treatments
- Maintains or improves functional condition
- Does not increase structural capacity

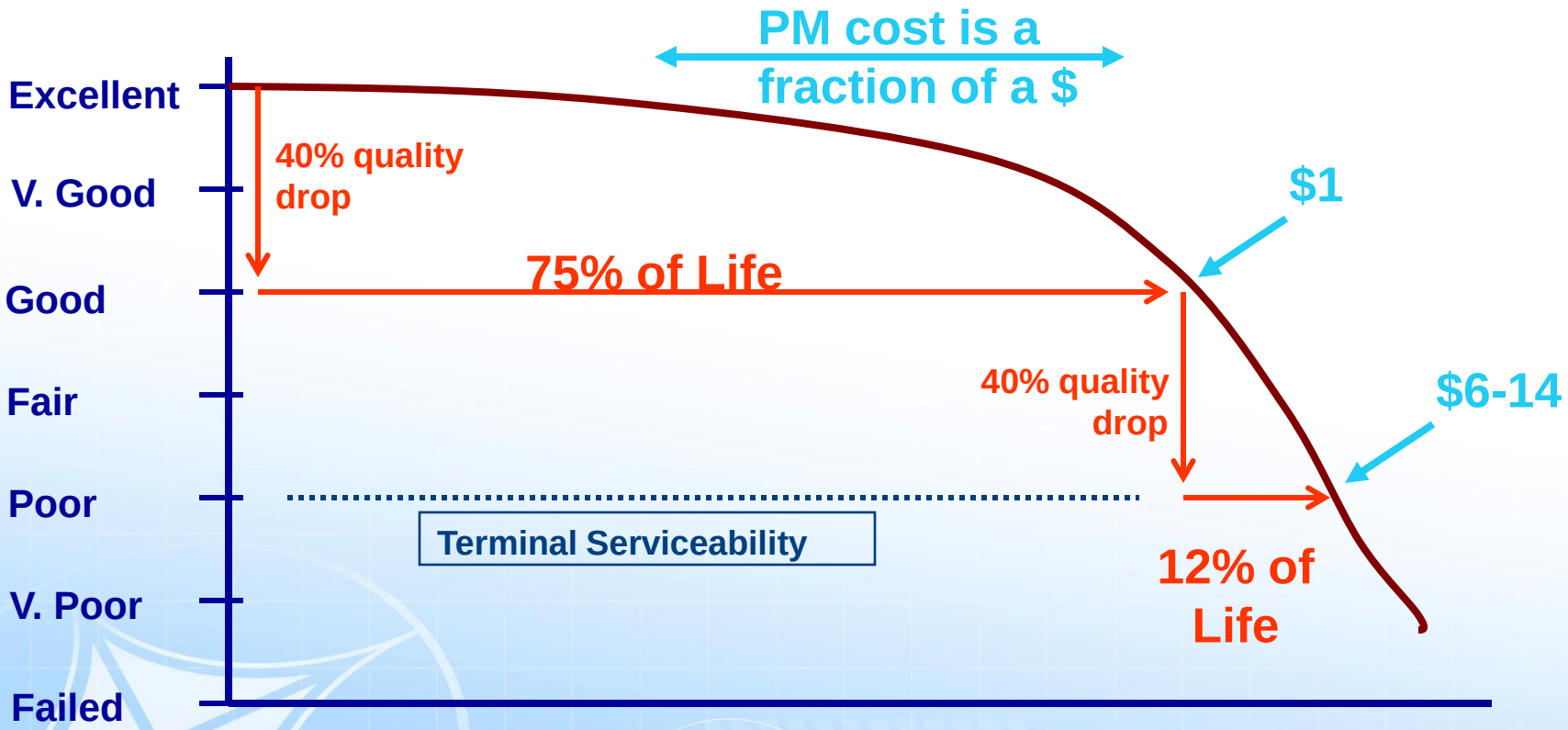
Maintaining good roads in good condition.

Preventive Maintenance is a strategy

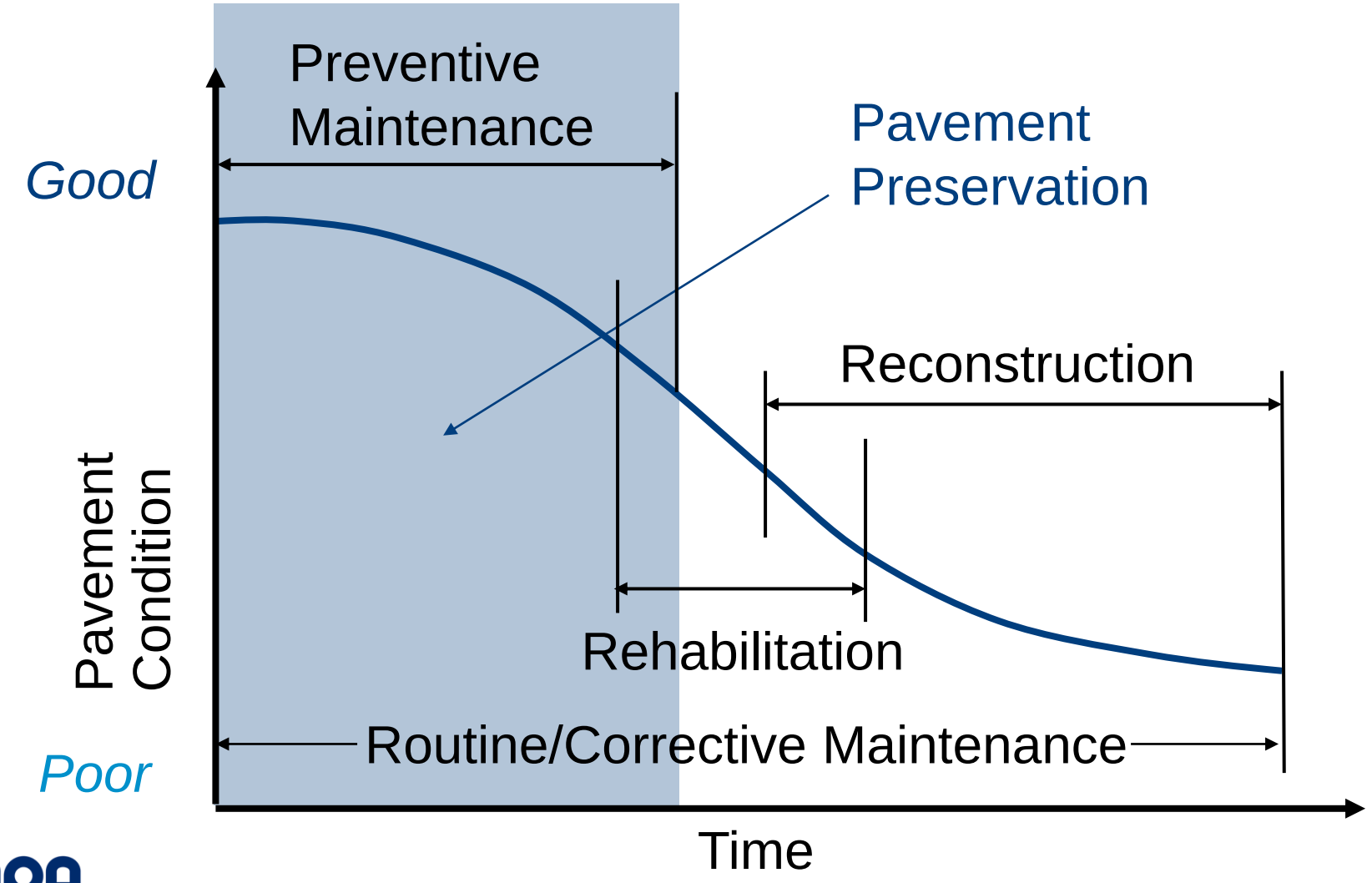
The **planned strategy** of **cost-effective** treatments to an existing roadway system and its appurtenances that **preserves the system**, retards future deterioration, and maintains or improves the **functional condition** of the system (without substantially increasing structural capacity).

American Association of State Highway and Transportation Officials

Pavement Condition vs Time



Preventive Maintenance Timing



There Are Many Common Flexible Pavement Treatments

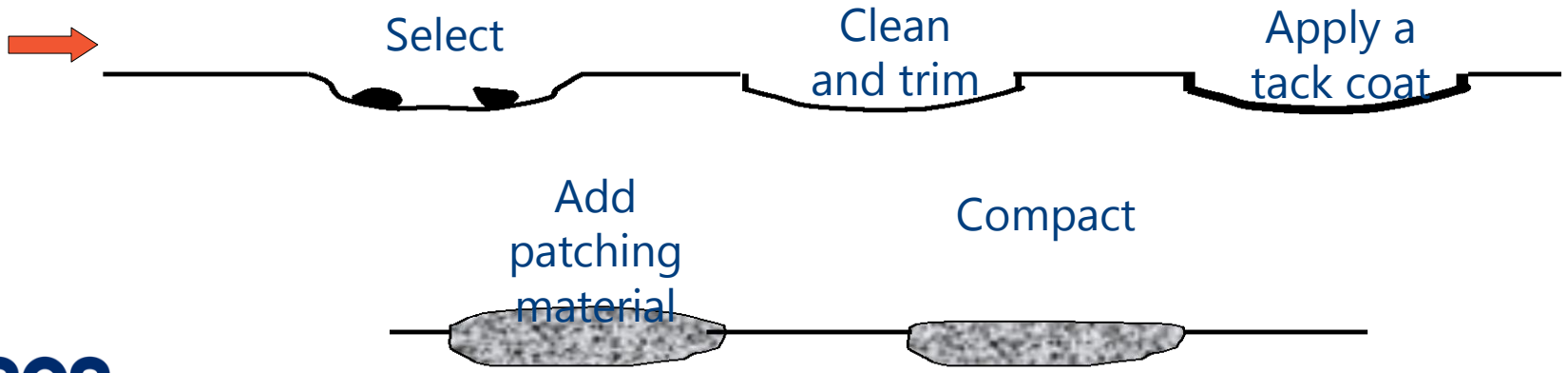
- Crack Sealing
- Patching
- Fog Seal
- Sand Seal
- Slurry Seal
- Chip Seal
- Micro-surfacing
- Texturization
- Thin Overlay
- Hot In-Place Recycling

Crack Treatments

- **Prevent water and debris from entering individual cracks in the HMA pavement surface**

Patching

- Address localized areas of distress
- Correct surface discontinuities
- Seal the pavement from moisture infiltration



Fog Seal

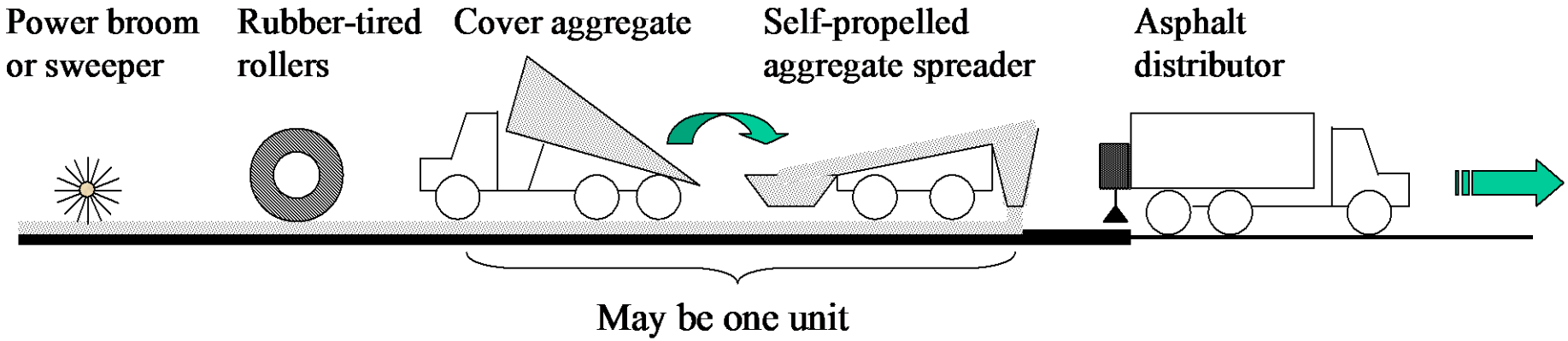
- Seal pavement surface
- Rejuvenate oxidized HMA
- Provide delineation

Slurry Seal

- Seal pavement surface
- Retard surface raveling
- Improved surface friction

Asphalt Chip Seal

- Provide wearing course
- Improve surface friction
- Seal pavement surface from water penetration
- Lower maintenance, eliminate dust



Asphalt Chip Seal

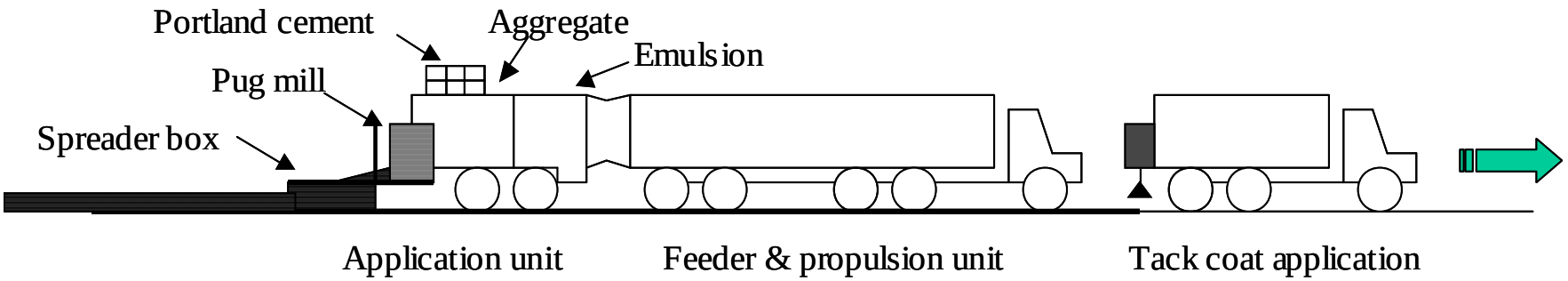
Localized Chip Seal

Microsurfacing

- Similar to slurry seal

  BUT…..

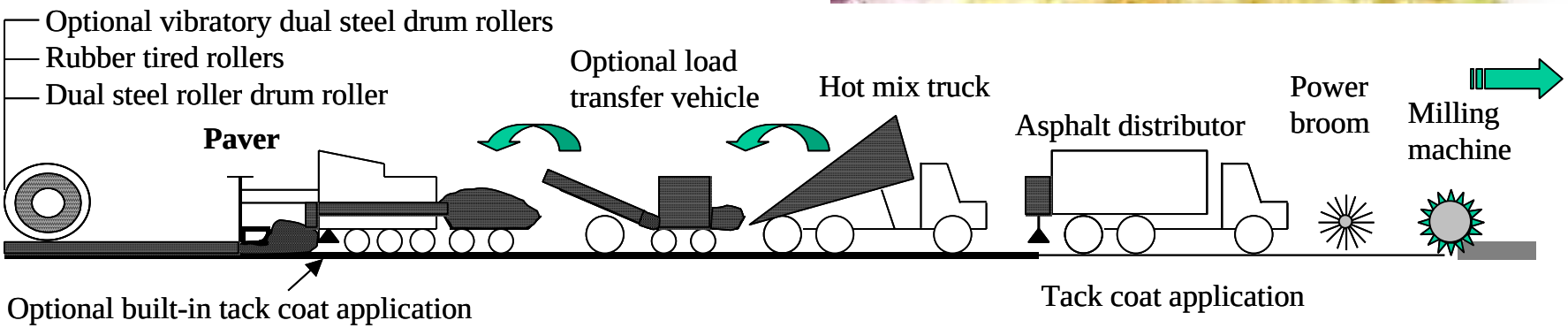
- Large and higher quality aggregate
- Modified emulsion & Portland Cement



Microsurfacing

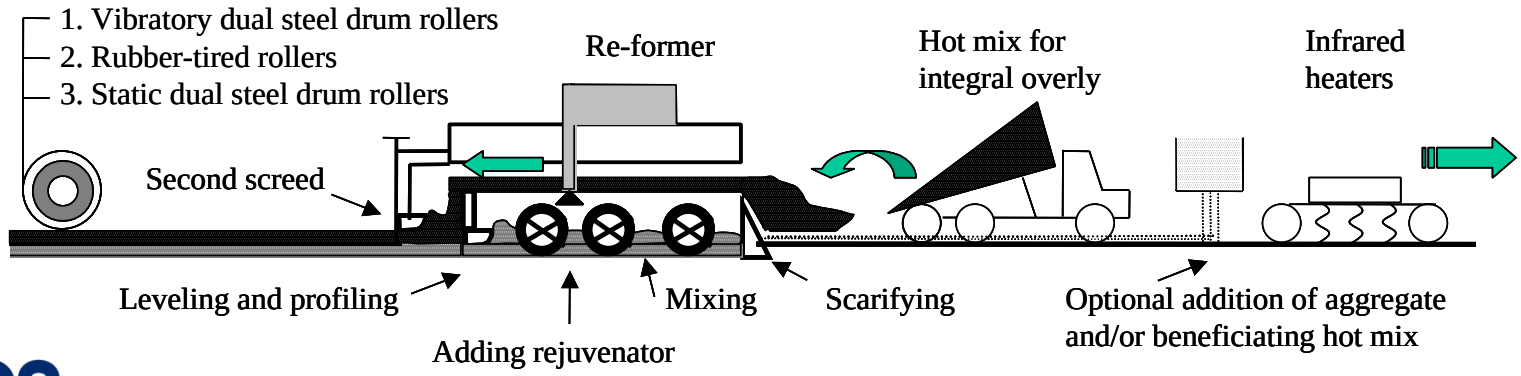
Thin Hot Mix Overlay

- Wearing course
- Level pavement
- Improve friction
- Seal pavement
- Fills ruts



Hot In-Place Recycling

- Reduce rutting
- Reduce roughness
- Improve friction
- Reduce distress



How long does it last?

PM has large range of life extension

Treatment	Reported Extended Service Life Range (Years)
Thin Overlay	3-23
Chip Seal	3-8
Microsurfacing	3-8
Crack Sealing	0-4
Mill and Resurfacing	4-20
Hot In-place Recycling	3-8
Slurry Seal	4-7
Fog Seal	4-5
Cold In-place Recycling	4-17
Full Depth Reclamation	10-20
Structural Overlay (Mill and Fill)	6-17
Whitetopping	3-17

FHWA-HIF-10-020, January 2010

Service Life Range Related To Environmental Differences

Service Life Range Related To Construction Quality Standards

Service Life Range Related To Variations on Material Quality

Service Life Range Related To Using PM Treatments as a Temporary Fix

A Few Questions on Pavement Maintenance


SPEED LIMIT
45
BAD


What would you rather do?
Mill and Overlay

Or Full Reconstruction?

Right Treatment on the Right Road at the Right Time


Stop the Water Infiltration?

Watch it Deteriorate the Pavement?


Until you have to Reconstruct it?

Right Treatment on the Right Road at the Right Time


Rout and Seal this Crack at $0.50/ft?


Dig this out and Patch it at $25/ft?

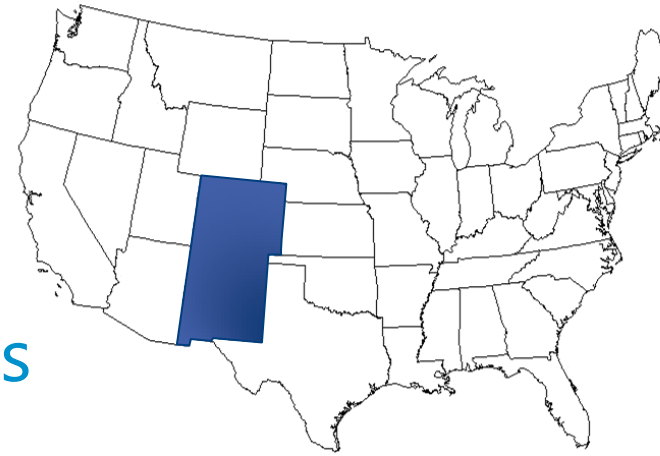
Right Treatment on the Right Road at the Right Time


THERE! THAT OUGHTA DO IT.
NICE JOB.

Benefit Study - Structural Data in Preservation

Goals of Project Analysis

- Single set of combined data
- single set of analysis results
- Generic, yet meaningful" analysis



Comparative 50-year Life Cycle Cost

- **Consider present worth value of a new road built in 2012**

"Worst-First" Scenario	
M&R Activity	Year
Mill & AC Overlay	14
Mill & AC Overlay	27
Mill & AC Overlay	39
Total M&R Cost (2012 USD)	$ 283,964

Preventive Maintenance Scenario	
M&R Activity	Year
Distress Repair	3
Surface Treatment	8
Surface Treatment	15
Mill & AC Overlay	26
Distress Repair	29
Surface Treatment	34
Surface Treatment	41
Total M&R Cost (2012 USD)	$ 215,720

RWD-based preventive maintenance provides 24% reduction in life-cycle cost

Decision matrix guides treatment selection

SURFACE AND STRUCTURAL CONDITION

PCI Value	PCI Rating	Representative RWD Deflection, mils: < 35 (Good)	35 - 50 (Fair)	> 50 (Poor)
100	Very Good	Defer Maintenance		
		PM - Crack sealing (max. 1 time)		
80	Good	Microsurfacing (max. 1 time)		Distress Repair (max. 1 time)
		Cape Seal (max. 2 times)		
60	Fair	*FEASIBILITY*		Mill & Thick ACOL w/ FD Repairs
		Mill & Thin ACOL	Mill & Thin ACOL w/ FD Repairs	
40	Poor	Mill & Thin ACOL w/ PD Repairs	Mill & Thick ACOL w/ PD Repairs	*FEASIBILITY*
20	Failed	RECONSTRUCTION		
0				

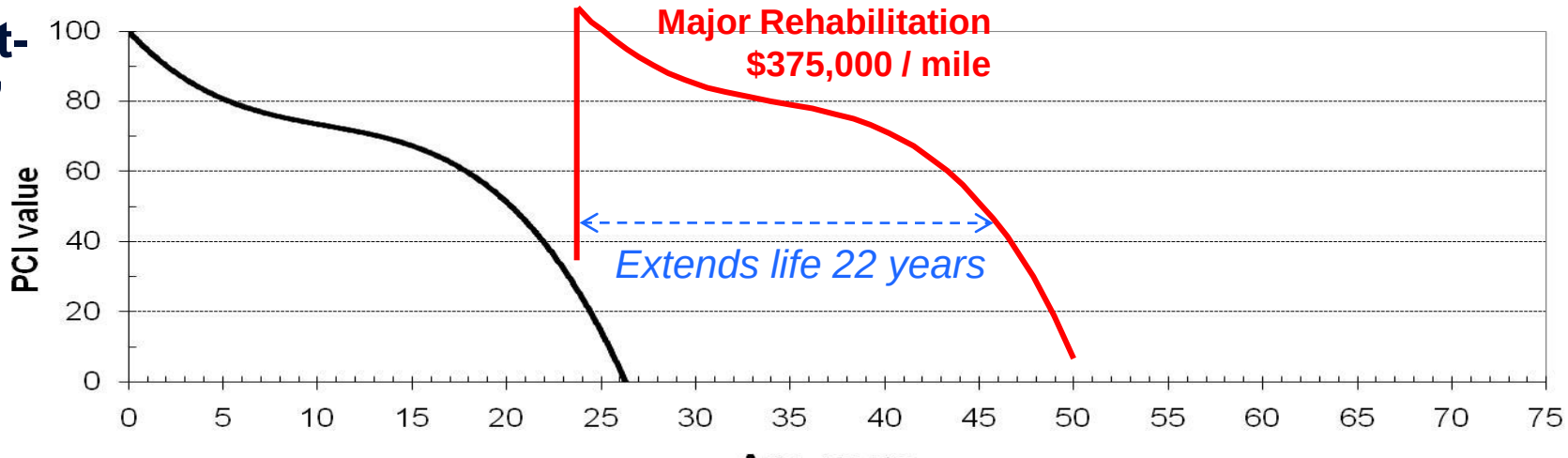
TRADITIONAL

Surface Condition Only

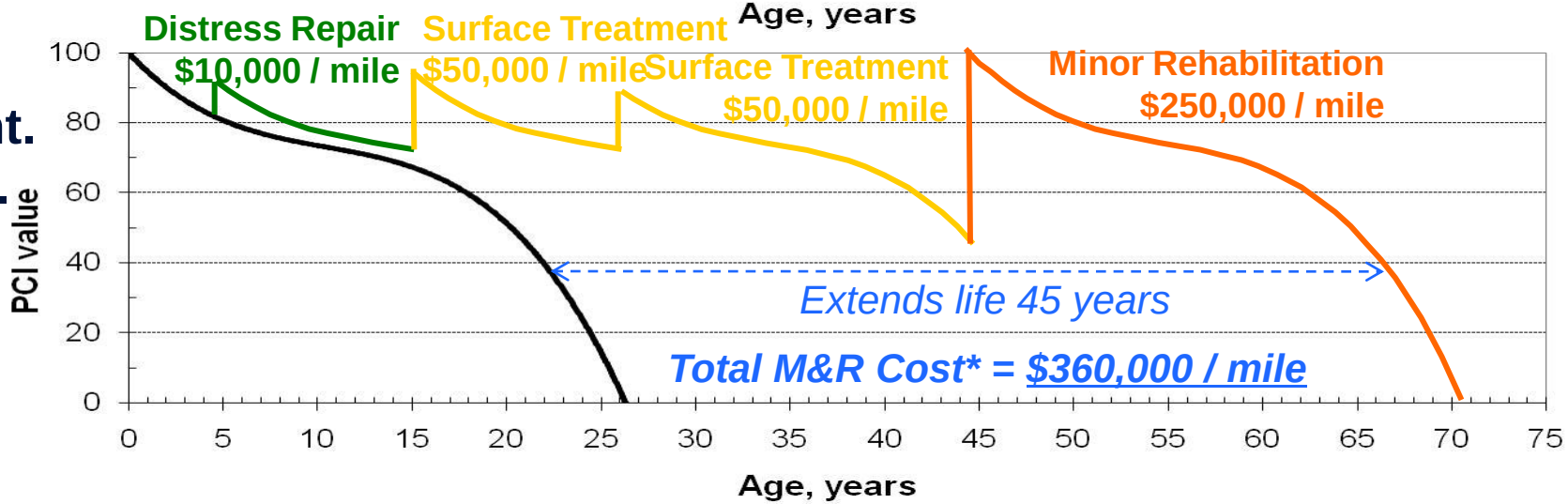
- Defer Maintenance
- Distress Repair
- Surface Treatment (Preventive Maint.)
- Minor Resurfacing
- Major Resurfacing
- RECONSTRUCTION

Preventive Maintenance Pays Off

"Worst-First"



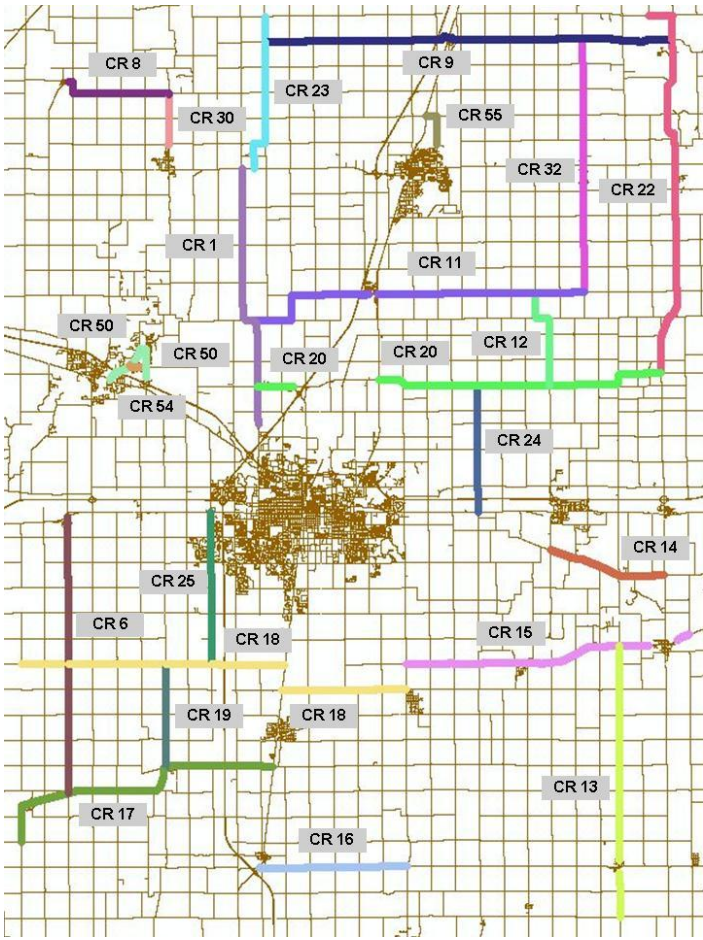
Prevent. Maint.



** Does not account for inflation or discounting*

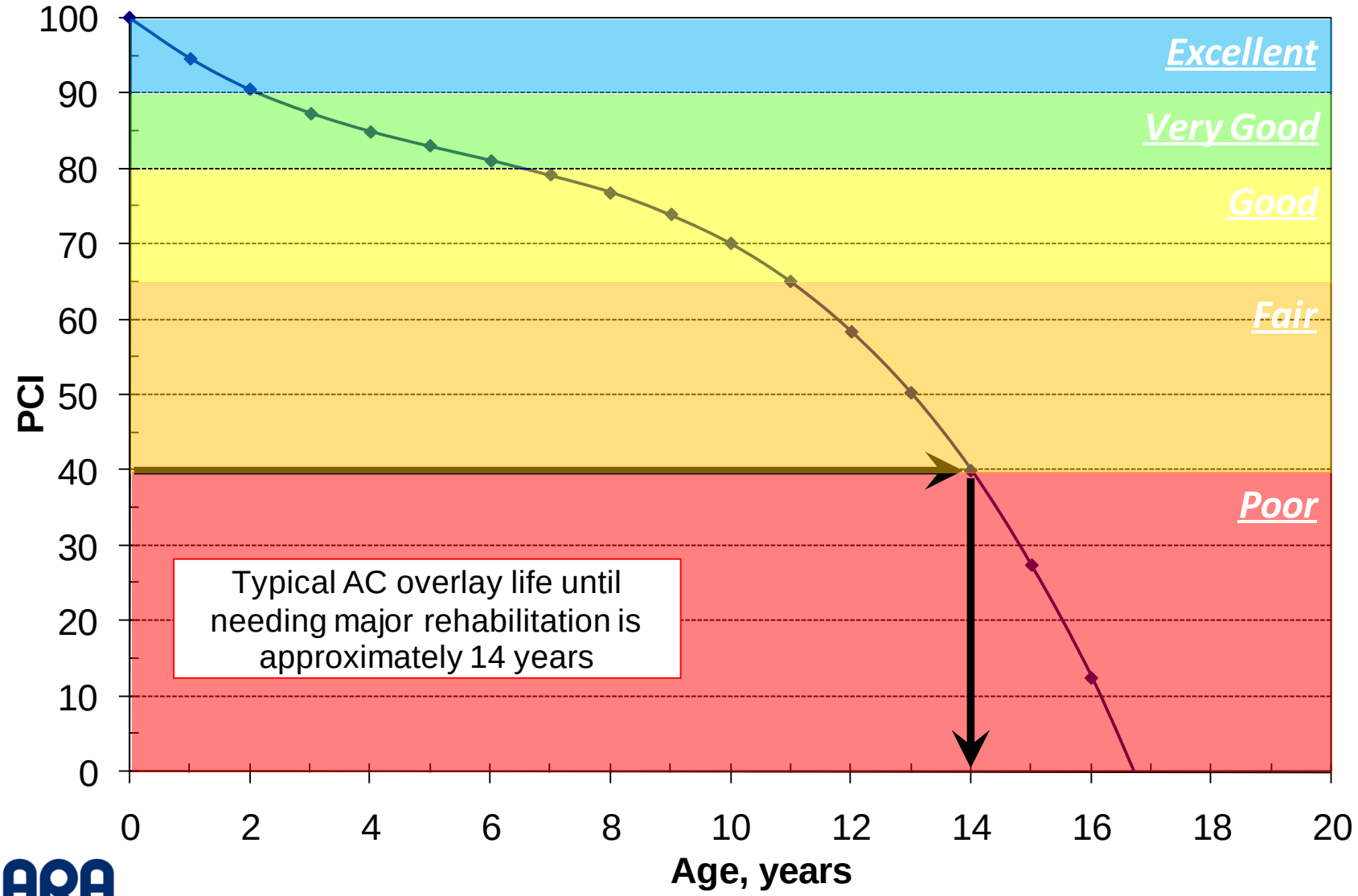
Pavement Management-Preservation Case Study

- **Champaign County**
  - One major population center
- **Highway Department**
  - 400 lane mile network
  - 2-lane low-volume paved roads
  - Highly variable pavements
- **The challenge**
  - $3M annual road funding
  - $1M diverted to non-county roads

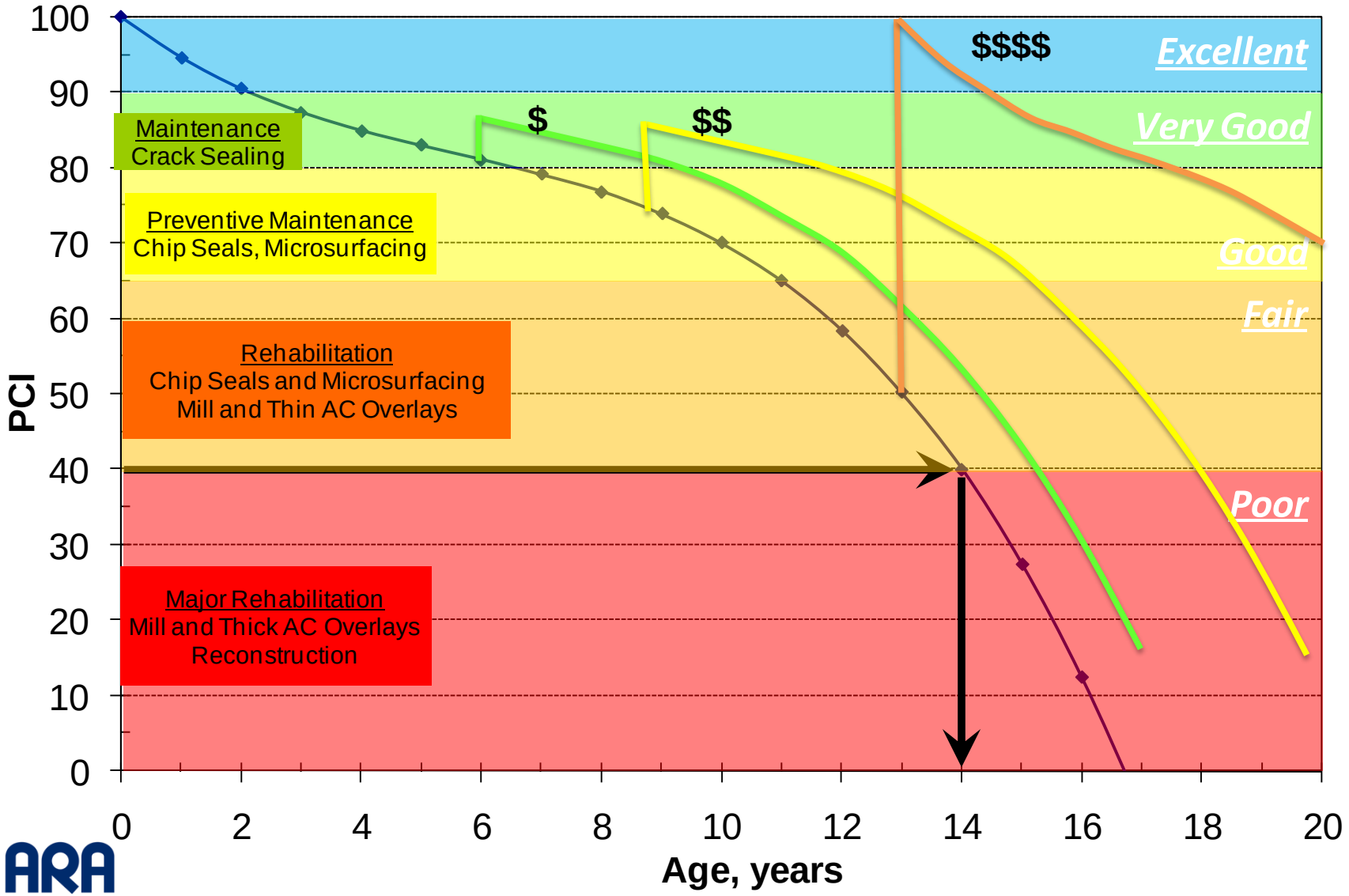


Can the county maintain its network with these diversions?

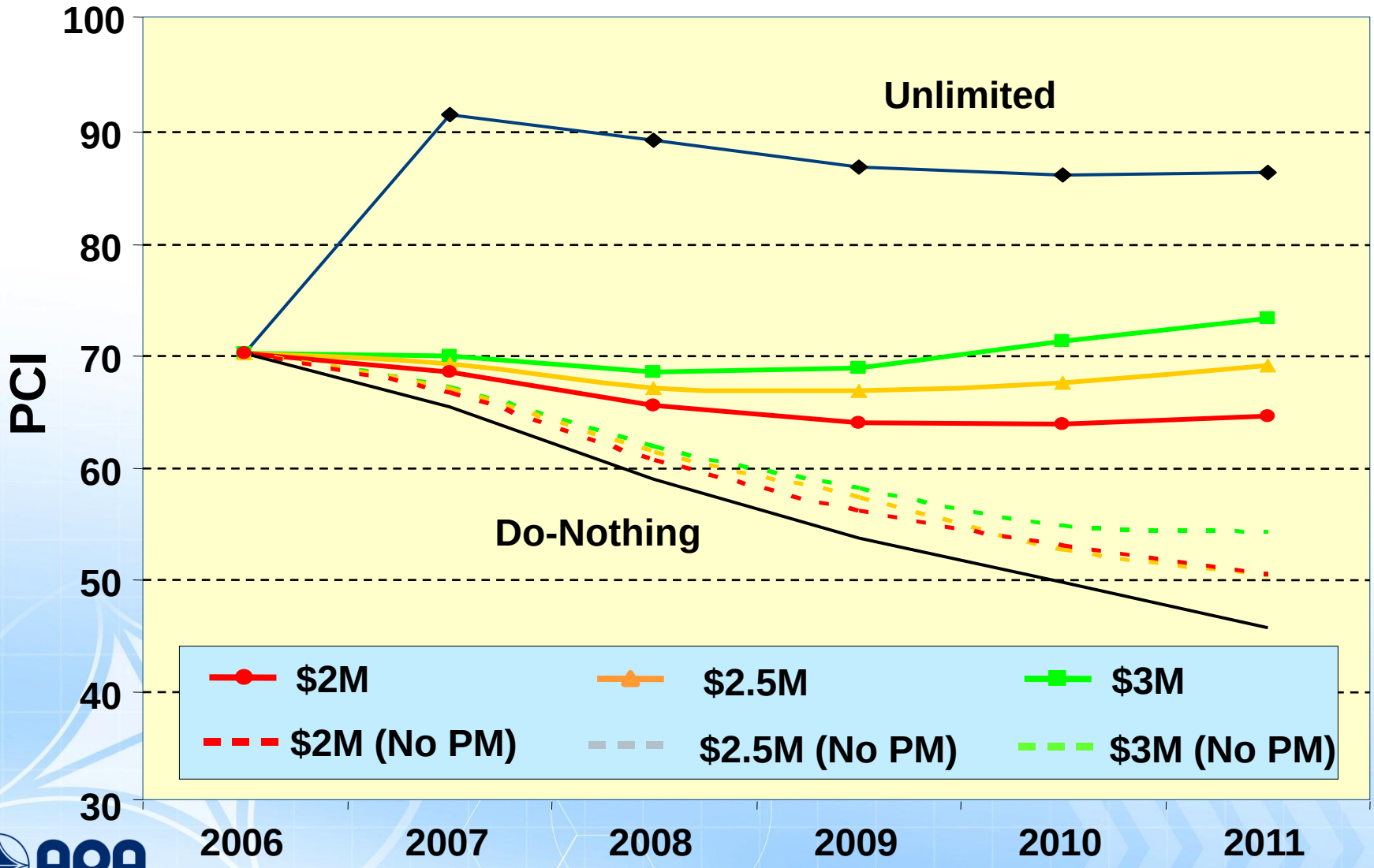
Typical Performance Curve



Adding in Treatments



No Preventive Maintenance



Cost and Performance of PM

- **Cost**
  - Low cost treatments – Construction Cost
  - Keeps good roads in good condition – Agency Cost
  - Extends pavement life – Industry Cost
- **Performance - It depends**
  - Right Treatment, Right Road, Right Time

Thank You!

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